

THE CHANGING ENVIRONMENT

By C. B. PALMER, Bassendean.

The fact of evolution is generally accepted by biologists, but there are many opinions regarding how it proceeds. Basically it is a process of changing hereditary characters. It must be recognised, however, that heredity is only a potentiality; it can come to nothing in the absence of an appropriate environment. Hence the environment has a controlling influence on evolution, although it is generally understood it cannot initiate any hereditary character. The diversity of life is due to species having arisen to fill "ecological niches," or in other words, adapted to special conditions.

Change of environment certainly alters survival value in the struggle for existence. This is a slow process when depending on climatic and geological changes, but may be very rapid if due to human activities, and is of particular economic importance in Australia. In the past there has been a varying degree of intensity of competition between species and individuals in the large land masses of the world. It has been fierce in Africa, resulting in a great diversity of fauna and flora, rather less in Euro-Asia and America, and least of all in Australia. Conversely the balance of nature has been upset most by white settlement in this continent.

Population pressure (not limiting the term to human population) increases the rate of evolutionary advance, but this does not proceed at a uniform rate. It is well known that under particularly favourable conditions a species may increase rapidly, and then abruptly decline. During the period of increase, there is little competition, almost all the individuals survive, and any mutations increase in frequency. Then comes the change in conditions, the struggle for existence is intense, and only the fittest survive. So new species become established and old species die out, or become modified.

Human civilization greatly enhances the chance of species fluctuating numerically as agriculture periodically provides food in abundance. Settlement so profoundly affects wild life, that we must regard the environment of the future as being largely artificial, and there will be an increasing need to protect the dwindling numbers of many indigenous species. It must be recognized, however, that some species would have become extinct even if white men had not settled here. A review of how settlement has disturbed the natural conditions may help us to assess the future trend.

Pastoral settlement has been more destructive to the flora than the fauna of Australia. The vast flocks and herds of grazing animals have seriously depleted large areas of native plants, which are ill adapted to continual grazing. Their place has to some extent been taken by hardy exotic species, but widespread soil erosion is the direct result of heavy stocking. One unexpected result of pastoral settlement has been the increase of kangaroos and emus. In view of the fact that generally the pastoralists do not cultivate crops and the domesticated animals compete for the vegetation, this may seem

strange. The explanation is that the provision of water at many more places has been of benefit to the wild mammals and birds, and they are not confined to the fenced paddocks, so can feed in places inaccessible to sheep and cattle.

Factors other than stock grazing, have also had an effect on the outback conditions. Ringbarking, and scrub lopping have made the country more desolate, but most of all has been the spread of rabbits. The repercussion of the rabbit invasion has probably been one of the biggest factors in disturbing the biological balance. One direct result has been the concomitant increase of the predatory carnivora—foxes and dingoes. Attempting to control them, pastoralists have laid poison baits, often indiscriminately, and many harmless wild creatures have been victims.

It is in the agricultural areas where most change in the environment has been effected. On hundreds of square miles the natural vegetation has been entirely destroyed, resulting in a rapid increase in exotic ruderal weeds, particularly ephemeral annuals. Enormous quantities of grain are grown and there is abundant food right through the summer. Even when there is no grain in the fields, there is plenty around haystacks and where stock is fed. As water supplies also are provided, the increase of granivorous birds is inevitable. Galahs, Port Lincoln and smoker parrots have become pests over most parts of the wheat belt, and domestic pigeons and the introduced doves (especially the Senegal) are extending their range. Some carnivorous birds, the carrion eaters in particular, find the changed conditions favourable, but some insectivorous species tend to decrease (except during plagues of insects on cultivated crops).

The conditions favour rodents—rabbits, rats and mice; and predatory carnivores—foxes, dingoes and feral dogs and cats, but farmers are situated better than pastoralists to cope with these creatures. However, the methods of destruction leave much to be desired. Humanitarians can only deplore the use of barbarous steel traps and the fact that poisoned meat, grain and water placed in the open where all kinds of animals and birds, irrespective of whether they are beneficial or otherwise, may be killed. The ploughing of large areas tends to suppress the native, burrowing mammals and reptiles, many of which do nothing but good. A further result of agriculture in districts of comparatively low rainfall is the growing area of excessive salinity, and the formation of salt lakes. This is detrimental to many species of animals and plants, although a few kinds can tolerate salt. Taken generally, the settlement of the agricultural areas has favoured the increase of grain-eating birds and animals, but has been adverse to the rarer and insectivorous kinds. Native plants have been seriously affected by cultivation, close grazing, and the application of superphosphate. On the other hand, introduced weeds have spread through the whole areas; many flourish more in Australia than in their country of origin.

In the heavier-timbered country of the South-west, the impact of settlement has not affected the native flora and fauna so much.

The cost of clearing in the past has precluded the denudation of large areas. In the future, the use of bulldozers and other powerful machinery may alter this, and then the trend will be in the same general direction as in the wheatbelt. Although no large areas in the forest have been cleared outright, considerable change has been made by partial clearing. First there is the removal of the finest trees for sawmilling purposes; then, large areas have been ring-barked or burnt to induce grass to grow. This has had the effect of destroying or diminishing the overhead canopy which is characteristic of the virgin forest. By letting in the sun and wind, the humidity of the air and the formation of humus is less, with a consequent change in the character of the ground vegetation. However, the amount of change has not been sufficiently great to cause noticeable differences in the biological balance. The very large areas reserved for forestry and water catchments will always be sanctuaries for wild life, and this is probably the most hopeful feature from a naturalist's point of view.

As time goes on, we must expect that other animals and plants will be introduced, either intentionally or accidentally, and the struggle for survival become more intense. The struggle will not be only between native and introduced species. Some indigenous kinds may be able, not only to hold their own, but become more numerous. It is the rarer and beneficial species that will have to be protected. This involves study of their habits and haunts, and it may be necessary to provide artificial protection such as provision of food, water or breeding sites. During recent years publicity has been given to the dangers of soil erosion. This has had the effect of making landowners conscious of the value of trees. Many are now making reservations of portions of their properties for afforestation. This will have a generally beneficial influence in preserving wild life.

Looking to the future, we must realize that the environment will be controlled more and more by human agency. The biological balance is important for economic reasons. Only by intensive study can we hope to understand the problems involved, and so be competent to control the environment.

FROM FIELD AND STUDY

Multiple Broods of Yellow-tailed Thornbill.—Last year (1947), about the beginning of November, I found a Yellow-tailed Thornbill's nest in a low branch of a Christmas tree. The two thornbills used the nest until the end of February this year. In all, four separate lots of eggs were laid, and in each case the young hatched out and got away safely.

—R. R. GREENHOW, Cookernup.

A Fish New to Western Australia.—Early in October, 1948, the Museum received two very interesting fish, one from the Chief Inspector of Fisheries, the other from the C.S.I.R., Fisheries Division. They had both been caught by Capt. R. Saunier of the